

EXHIBIT R-2, RDT&E Budget Item Justification							DATE: February 2000			
APPROPRIATION/BUDGET ACTIVITY					R-1 ITEM NOMENCLATURE					
RESEARCH DEVELOPMENT TEST & EVALUATION, NAVY/BA-4					Shipboard System Component Development/0603513N					
COST (\$ in Millions)		FY 1999	(7) FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Total PE Cost		99.395	113.474	244.437	317.176	239.701	136.747	116.371	CONT.	CONT.
AGS-Advanced Gun System/32467		(1) 15.025	28.755	101.956	139.844	108.878	51.613	47.449	CONT.	CONT.
Undersea Warfare (USW)/32468		(2) 10.312	15.554	21.235	25.466	20.652	16.790	16.756	CONT.	CONT.
Shipboard Auxiliary System Development/S0382		2.927	(3) 0.000	0.000	0.000	0.000	0.000	0.000	0.000	N/A
Consolidated HM&E/32469		(4) 24.344	24.686	22.109	26.847	26.069	26.444	26.822	CONT.	CONT.
HM&E Improvement/S1712		0.957	(5) 0.000	0.000	0.000	0.000	0.000	0.000	0.000	N/A
Integrated Topside Design (ITD)/32470		13.022	(5) 13.756	15.080	18.742	14.760	15.040	15.387	CONT.	CONT.
Shipboard Sys Component Development/S2608		0.968	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.968
Integrated Power Systems (IPS)/32471		(6) 31.840	25.723	84.057	106.277	69.342	26.860	9.957	CONT.	CONT.
Man Overboard Indicator/32729		0.000	3.000	0.000	0.000	0.000	0.000	0.000	0.000	3.000
Ship Survivability & Personnel Protection/32730		0.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000
Advanced Water Jet Technology/S2751		0.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000
Quantity of RDT&E Articles		0	0	0	0	*2/TBD	0	0		
<p>Note (1) (U) FY 1999 funds were budgeted and executed under PE 0603795N/Project K2323 as displayed in the FY99 President's Budget exhibits. Funds from PE 0603795N/Project K2323 transitioned into PE 0603513N/Project 32467 in FY 2000 and out.</p> <p>Note (2) (U) FY 1999 funds were budgeted and executed under PE 0603553N/Project S1704 as displayed in the FY99 President's Budget exhibits. Funds from PE 0603553N/Project V1704 (except Distant Thunder) transitioned into PE 0603513N/Project 32468 in FY 2000 and out.</p> <p>Note (3) (U) FY 1999 funds were budgeted and executed under PE 0603513N/Project S0382 as displayed in the FY99 President's Budget exhibits. Funds from PE 0603513N/Project S0382 transitioned into PE 0603513N/Project 32469 in FY 2000 and out.</p> <p>Note (4) (U) FY 1999 funds were budgeted and executed under PE 0603513N/Project S0382, PE 0603514N/Project S0384, PE 0603514N/Project S1565, and PE 0603563N/Project S2196 (only Affordability Through Commonality) as displayed in the FY99 President's Budget exhibits. Funds from PE 0603513N/Project S0382, PE 0603514N/Project S0384, PE 0603514N/Project S1565, and PE 0603563N/Project S2196 (only Affordability Through Commonality) transitioned into PE 0603513N/Project 32469 in FY 2000 and out.</p> <p>Note (5) (U) FY 1999 funds were budgeted and executed under PE 0603513N/Project S1712 as displayed in the FY99 President's Budget exhibits. Funds from PE 0603513N/Project S1712 transitioned into PE 0603513N/Project 32470 in FY 2000 and out.</p> <p>Note (6) (U) FY 1999 funds were budgeted and executed under PE 0603573N/Project S1314 as displayed in the FY99 President's Budget exhibits. Funds from PE 0603573N/Project S1314 (only Integrated Power System) transitioned into PE 0603513N/Project 32471 in FY 2000 and out.</p> <p>Note (7) (U) \$2.421M of the FY01 amount is that portion of the extramural program reserved for Small Business Innovation Research assessment in accordance with 15 USC 638.</p>										

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EXHIBIT R-2, RDT&E Budget Item Justification		DATE:	February 2000																								
APPROPRIATION/BUDGET ACTIVITY RESEARCH DEVELOPMENT TEST & EVALUATION, NAVY/BA-4		R-1 ITEM NOMENCLATURE Shipboard System Component Development/0603513N																									
<p>A. (U) MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: This Program Element (PE) has been modified in FY 2000 and out to focus on DD 21 associated systems development. Specific DD 21 associated systems development efforts that have been realigned under this PE include: the Advanced Gun Systems (formerly the Vertical Gun for Advanced Ships); Undersea Warfare; Integrated Topside Design; and Integrated Power Systems. In addition, a number of HM&E development tasks have been incorporated into a consolidated HM&E Project (32469) focused on DD 21. In FY 00, DD-21 was provided Congressional funding for Man Overboard Indicator, Ship Survivability & Personnel Protection, and Advanced Water Jet Technology. Man Overboard Indicator funds will be used to test and evaluate devices that improve the safety of flight and helicopter deck personnel. Ship Survivability & Personnel Protection funds will be used for the evaluation of commercial off-the-shelf, non-developmental items(COTS/NDI) for personnel protection and survivability equipment and technologies including personnel locators and NDI devices to facilitate improved casualty response. Advanced Water Jet (AWJ) Technology funds will be used to validate the performance of AWJ-21 using hydronumeric modeling and simulation design tools and small scale physical model tests.</p> <p>(U) This PE now provides funds for the development of the DD 21 Class of U. S. Navy surface combatants and its components. The mission of the DD 21 class is to provide affordable credible independent forward presence/deterrence and operate as an integral part of Naval, Joint or Combined Maritime Forces. DD 21 will provide an advanced level of land attack in support of the ground campaign and contribute to Naval, Joint or Combined battlespace dominance in littoral operations. It will establish and maintain surface and sub-surface superiority, provide local air defense, and will incorporate signature reduction to operate in all threat environments. DD 21 will have seamless Joint Interoperability to integrate all source information for battlespace awareness and weapons direction.</p> <p>* (U) For explanation of Test Articles see Projects 32467.</p> <p>B. (U) PROGRAM CHANGE SUMMARY:</p> <table border="0" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 35%;"></th> <th style="width: 15%; text-align: center;"><u>FY 1999</u></th> <th style="width: 15%; text-align: center;"><u>FY 2000</u></th> <th style="width: 15%; text-align: center;"><u>FY 2001</u></th> </tr> </thead> <tbody> <tr> <td>FY 2000 President's Budget:</td> <td style="text-align: right;">100.748</td> <td style="text-align: right;">108.334</td> <td style="text-align: right;">114.643</td> </tr> <tr> <td>Appropriated Value:</td> <td style="text-align: right;">135.958</td> <td style="text-align: right;">113.334</td> <td></td> </tr> <tr> <td>Adjustment to FY 1999/2000 Appropriated Value/</td> <td style="text-align: right;">-36.563</td> <td style="text-align: right;">+ 0.140</td> <td style="text-align: right;">+129.794</td> </tr> <tr> <td>FY 2000 President's Budget:</td> <td></td> <td></td> <td></td> </tr> <tr> <td>FY 2001 PRES Budget Submit:</td> <td style="text-align: right;">99.395</td> <td style="text-align: right;">113.474</td> <td style="text-align: right;">244.437</td> </tr> </tbody> </table>					<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	FY 2000 President's Budget:	100.748	108.334	114.643	Appropriated Value:	135.958	113.334		Adjustment to FY 1999/2000 Appropriated Value/	-36.563	+ 0.140	+129.794	FY 2000 President's Budget:				FY 2001 PRES Budget Submit:	99.395	113.474	244.437
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EXHIBIT R-2, RDT&E Budget Item Justification

DATE:

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APPROPRIATION/BUDGET ACTIVITY

RESEARCH DEVELOPMENT TEST & EVALUATION, NAVY/BA-4

R-1 ITEM NOMENCLATURE

Shipboard System Component Development/0603513N

(U) The FY 1999 net decrease of \$36.563M is due to decreases for comparability adjustment (-\$22.911M), Restructure/Comparability (-\$10.235M), Small Business Innovative Research (-\$1.060M), Revised Economic adjustment (-\$0.059M), Inflation Savings (-\$0.459M), Below Threshold Reprogrammings (-\$0.047M), Congressional cut (-\$3.000M), and Actual Update (-\$1.994M) is offset by increases for Civilian Personnel underexecution (+\$0.002M), Congressional add (+\$1.000M), TOC Initiative (+\$2.200M).

(U) The FY 2000 net increase of \$.140M is due to Outsourcing restoration.

(U) The FY2001 net increase of \$129.794 is due to miscellaneous increases (outsourcing restoration/NWCF rate adjustments) of (+\$1.331), development of the Advanced Gun (+\$73.100), development of DD 21 Integrated Power System (+\$59.000), and miscellaneous decreases (contract efficiencies/ revised economic assumptions) of (-\$3.637).

(U) Schedule: See individual projects

(U) Technical Parameters: Technical parameters are contained in the DD 21 Operational Requirements Document (ORD) approved by JROC on 16 October 1997.

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EXHIBIT R-2a, RDT&E Project Justification						DATE: February 2000				
APPROPRIATION/BUDGET ACTIVITY		PROGRAM ELEMENT NAME AND NUMBER			PROJECT NAME AND NUMBER					
RDT&E, N/BA-4		Shipboard Sys Component Dev/0603513N			AGS-Advanced Gun System/32467					
COST (\$ in Millions)		FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Project Cost		(1) 15.025	28.755	101.956	139.844	108.878	51.613	47.449	CONT.	CONT.
RDT&E Articles Qty		0	0	0	0	2	0	0	CONT.	CONT.
<p>Note (1) (U) FY 1999 funds were budgeted and executed under PE 0603795N/Project K2323 as displayed in the FY99 President's Budget exhibits. Funds from PE 0603795N/Project K2323 transitioned into PE 0603513N/Project 32467 in FY 2000 and out.</p> <p>A. (U) MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: These funds provide for the development of the Advanced Gun System (AGS) associated with the development of DD 21. The AGS will consist of a major caliber gun, an automated ammunition handling system and a family of munitions/propelling charges. The AGS will, at a minimum, meet the Land Attack and Surface Dominance Missions assigned to the gun system. The system will provide a high rate of fire (approximately 12 rounds per minute) with a magazine capacity sufficient in size for meeting USMC operational requirements. Land based testing of prototype hardware to verify system design will commence in FY 2003.</p> <p>1. (U) FY 1999 ACCOMPLISHMENTS</p> <ul style="list-style-type: none"> - (U) (\$0.770) Conducted congressionally directed independent analysis of AGS concepts and delivered report to Congress. - (U) (\$ 12.000) Completed AGS Concept Development phase under an existing agreement with Industry as an integral part of the DD 21 contract. - (U) (\$ 2.255) Defined AGS operational environment. <p>2. (U) FY 2000 PLAN</p> <ul style="list-style-type: none"> - (U) (\$14.500) Initiate AGS Sub-system design phase. - (U) (\$4.055) Complete AGS munitions concepts; develop performance and interface specifications. - (U) (\$1.600) Develop proof of concept test fixture. - (U) (\$8.600) Develop Validation and Verification (V&V) tools for AGS. 										

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EXHIBIT R-2a, RDT&E Project Justification						DATE: February 2000				
APPROPRIATION/BUDGET ACTIVITY RDT&E, N/BA-4		PROGRAM ELEMENT NAME AND NUMBER Shipboard Sys Component Dev/0603513N			PROJECT NAME AND NUMBER AGS-Advanced Gun System/32467					
<p>3. (U) FY 2001 PLAN</p> <ul style="list-style-type: none"> - (U) (\$61.238) Complete AGS Sub-system design phase. - (U) (\$16.288) Initiate Engineering and Manufacturing Development (E&MD) for AGS munitions; Conduct Industry competition based on performance specifications. - (U) (\$5.141) Continue proof of concept test fixture development. - (U) (\$19.289) Continue development of V & V tools for AGS and AGS munitions. <p>B. (U) OTHER PROGRAM FUNDING SUMMARY:</p>										
COST (\$ in Millions)		FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	To Complete	Total Cost
SC-21 Total Ship Systems/Engineering/0604300N		120.704	161.118	305.274	303.989	617.796	763.620	857.350	CONT.	CONT.
<p>C. (U) ACQUISITION STRATEGY:</p> <p>(U) The Navy will conduct a comparison of concepts for the DD 21 Advanced Gun System. The Advanced Gun System will be acquired in conjunction with the DD 21 development schedule. Initial phases will be conducted under section 845/804 other transaction authority. Initial phases include: Phase I – Concept Formulation, Phase II - Initial Prototype Development, Phase III - Subsystem Testing and Validation.</p>										

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EXHIBIT R-2a, RDT&E Project Justification

DATE:

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APPROPRIATION/BUDGET ACTIVITY

RDT&E, N/BA-4

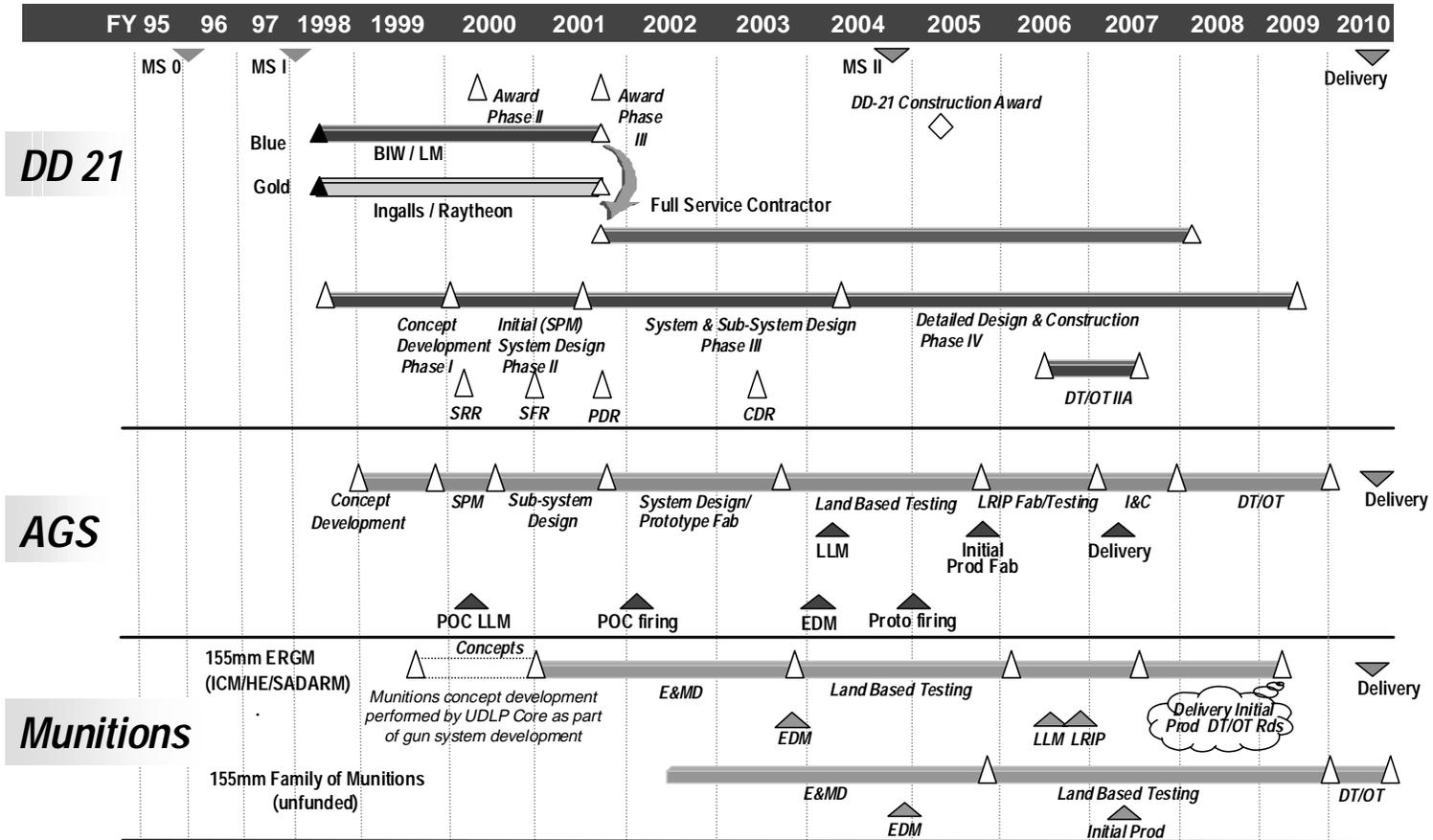
PROGRAM ELEMENT NAME AND NUMBER

Shipboard Sys Component Dev/0603513N

PROJECT NAME AND NUMBER

AGS-Advanced Gun System/32467

D. (U) SCHEDULE PROFILE:



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Exhibit R-3 Cost Analysis (page 1)										DATE: February 2000		
APPROPRIATION/BUDGET ACTIVITY			PROGRAM ELEMENT			PROJECT NAME AND NUMBER						
RDT&E, N/BA-4			Shipboard Sys Comp Dev/0603513N			AGS-Advanced Gun System/32467						
Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PY s Cost	FY 99 Cost	FY 99 Award Date	FY 00 Cost	FY 00 Award Date	FY 01 Cost	FY 01 Award Date	Cost to Complete	Total Cost	Target Value of Contract
Primary Hardware Development	Sec845/804	DD 21 Industry Teams	0.000	12.000	02/99	4.874	11/99	0.000	N/A	0.000	16.874	N/A
	Sec845/804	DD 21 Industry Teams	0.000	0.000		20.693	01/00	97.675	11/00	CONT.	CONT.	
Ancillary Hardware Development											0.000	
Systems Engineering											0.000	
Licenses											0.000	
Tooling											0.000	
GFE											0.000	
Award Fees											0.000	
Subtotal Product Development			0.000	12.000		25.567		97.675		CONT.	CONT.	
Remarks:												
Development Support Equipment											0.000	
Software Development											0.000	
Training Development											0.000	
Integrated Logistics Support											0.000	
Configuration Management											0.000	
Technical Data											0.000	
GFE											0.000	
Subtotal Support			0.000	0.000		0.000		0.000		0.000	0.000	
Remarks:												

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Exhibit R-3 Cost Analysis (page 2)								DATE: February 2000				
APPROPRIATION/BUDGET ACTIVITY			PROGRAM ELEMENT			PROJECT NAME AND NUMBER						
RDT&E, N/BA-4			Shipboard Sys Comp Dev/0603513N			AGS-Advanced Gun System/32467						
Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PY s Cost	FY 99 Cost	FY 99 Award Date	FY 00 Cost	FY 00 Award Date	FY 01 Cost	FY 01 Award Date	Cost to Complete	Total Cost	Target Value of Contract
Developmental Test & Evaluation										CONT.	0.000	
Operational Test & Evaluation										CONT.	0.000	
Tooling										CONT.	0.000	
GFE										CONT.	0.000	
Subtotal T&E			0.000	0.000		0.000		0.000		0.000	0.000	
Remarks: (U) No developmental or operational evaluation is scheduled during this period.												
Contractor Engineering Support												
Government Engineering Support	WR	NSWC DD Dahlgren, VA	0.000	0.908	12/98	1.520	12/99	2.102	12/00	CONT.	CONT.	
	WR	NSWC PHD Pt Hueneme, CA	0.000	0.475	12/98	1.100	12/99	1.154	12/00	CONT.	CONT.	
	WR	NSWC IH Indian Head, MD	0.000	0.105	12/98	0.150	12/99	0.175	12/00	CONT.	CONT.	
	WR	NSWC CD Bethesda, MD	0.000	0.100	12/98	0.000	12/99	0.075	12/00	CONT.	CONT.	
	WR	SSCSD San Diego, CA	0.000	0.170	12/98	0.000	12/99	0.125	12/00	CONT.	CONT.	
	TBD	Various	0.000	1.267	03/99	0.418	Various	0.650	Various	CONT.	CONT.	
Program Management Support											0.000	
Travel											0.000	
Labor (Research Personnel)											0.000	
Overhead											0.000	
Subtotal Management			0.000	3.025		3.188		4.281		CONT.	CONT.	
Remarks:												
Total Cost			0.000	15.025		28.755		101.956		CONT.	CONT.	
Remarks:												

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EXHIBIT R-2a, RDT&E Project Justification						DATE: February 2000				
APPROPRIATION/BUDGET ACTIVITY		PROGRAM ELEMENT NAME AND NUMBER			PROJECT NAME AND NUMBER					
RDT&E, N/BA-4		Shipboard Sys Component Dev/0603513N			Undersea Warfare (USW)/32468					
COST (\$ in Millions)		FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Project Cost		(1) 10.312	15.554	21.235	25.466	20.652	16.790	16.756	CONT.	CONT.
RDT&E Articles Qty		0	0	0	0	0	0	0	CONT.	CONT.
<p>Note (1) (U) FY 1999 funds were budgeted and executed under PE 0603553N/Project V1704 as displayed in the FY99 President's Budget exhibits. Funds from PE 0603553N/Project V1704 (except Distant Thunder) transitioned into PE 0603513N/Project 32468 in FY 2000 and out.</p> <p>A. (U) MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: The Undersea Warfare (USW) project provides advanced development demonstration and validation of technology for potential surface sonar and combat system application in conjunction with submarine efforts. Efforts focus on resolution of technical issues associated with providing capability against the year 2000 and beyond threat with emphasis on shallow water/littoral area USW and on Demonstration and Validation (DEM/VAL) of DD 21 Integrated Undersea Warfare (IUSW-21) concepts and technology. Key technology areas being investigated include: improvements in signal processing, advanced information processing, and multi-sensor data fusion to improve target detection and classification performance and reduce system manning requirements; and towed array, hull array and transducer technology to improve multi-static operation and in-stride mine avoidance. FY 2000 and subsequent efforts will focus on major technological and performance thrusts for DD 21 USW, which will define surface combatant USW capability for the Navy in the next century. These efforts will continue beyond DD 21 and provide improvements that apply across surface ship USW platforms. This project is funded as DEM/VAL because it develops and integrates hardware for experimental tests related to specific ship or aircraft applications.</p> <p>1. (U) FY 1999 ACCOMPLISHMENTS</p> <ul style="list-style-type: none"> - (U) (\$2.000) Began Concept Development for DD 21 Undersea Warfare, including risk mitigation plans and support for a Demonstration/Validation program to mitigate risk. - (U) (\$6.944) IUSW-21 BAA Risk Mitigation: Evaluated responses to a Broad Agency Announcement (BAA) and competitively awarded contracts and tasks to Industry, University and Government labs to mitigate risks associated with DD 21 USW system development. Risk mitigation addressed improvements in signal processing, advanced information processing, and multi-sensor data fusion to improve target detection and classification performance and reduced system manning requirements; and hull array and transducer technology to improve broad-band operation and in-stride mine avoidance. - (U) (\$1.368) IUSW-21 Systems Engineering: Completed IUSW-21 functional and operator task decomposition, identified technologies to be used to mitigate risks, established Dem/Val environment, oversaw risk mitigation effort, and conducted Dem/Val of products resulting from BAAs. 										

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EXHIBIT R-2a, RDT&E Project Justification						DATE: February 2000				
APPROPRIATION/BUDGET ACTIVITY RDT&E, N/BA-4		PROGRAM ELEMENT NAME AND NUMBER Shipboard Sys Component Dev/0603513N			PROJECT NAME AND NUMBER Undersea Warfare (USW)/32468					
<p>2. (U) FY 2000 PLAN</p> <ul style="list-style-type: none"> - (U) (\$5.000) DD 21 Industry Teams. Begin DD 21 USW initial system design. Participate in IUSW peer group and evaluate USW technologies. - (U) (\$2.244) DD-21 Industry Teams. Continue to advance USW technology to meet DD 21 requirements by competitively awarding contracts to further define mine avoidance, torpedo defense, and reduced manning risk mitigation efforts. - (U) (\$5.058) IUSW-21 BAA risk mitigation. Exercise FY00 option of BAAs awarded in FY99 to further define advanced information processing for automated detect classify and localize, data fusion, automated environmental adaptation, mine avoidance, and displays for reduced manning. - (U) (\$3.252) IUSW-21 System Engineering. Perform Integrated Peer Group (IPG) engineering reviews of IUSW-21 advanced technologies. Perform IUSW-21 ADM system engineering in preparation for FY02 at sea demonstration. Develop interface specifications and sea test plan <p>3. (U) FY 2001 PLAN</p> <ul style="list-style-type: none"> - (U) (\$15.536) DD 21 Industry Teams. Continue DD 21 USW system design. Participate in IUSW peer group and evaluate USW technologies. Develop and integrate IUSW-21 advanced technologies into ADM demonstration system. - (U) (\$1.531) IUSW 21 Risk Mitigation. Exercise FY01 option of BAAs awarded in FY99 and other risk reduction efforts to further define advanced information processing for automated detect classify and localize, data fusion, automated environmental adaptation, mine avoidance, and displays for reduced manning. - (U) (\$4.168) IUSW-21 System Engineering. Perform IPG engineering reviews of IUSW-21 advanced technologies. Perform IUSW-21 ADM system engineering in preparation for FY02 at sea demonstration. Finalize ADM sea test demonstration plan. <p>B. (U) OTHER PROGRAM FUNDING SUMMARY:</p>										
COST (\$ in Millions)		FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	To Complete	Total Cost
SC-21 Total Ship Systems/Engineering/0604300N		120.704	161.118	305.274	303.989	617.796	763.620	857.350	CONT.	CONT.

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DATE:

February 2000

APPROPRIATION/BUDGET ACTIVITY

RDT&E, N/BA-4

PROGRAM ELEMENT NAME AND NUMBER

Shipboard Sys Component Dev/0603513N

PROJECT NAME AND NUMBER

Undersea Warfare (USW)/32468

C. (U) ACQUISITION STRATEGY:

(U) In Contracting Phase I and II, DD 21 will use Section 845/804 agreement authority for the efforts conducted by the DD 21 Industry Teams. BAAs will be competitively awarded to further refine advanced information processing, broadband signal processing, hull array technology, and integrated stern mitigation and to provide further risk mitigation for DD 21 USW activities. In Contract Phases II and III responsibility for IUSW-21 ADM development will be with the DD 21 Industry Teams.

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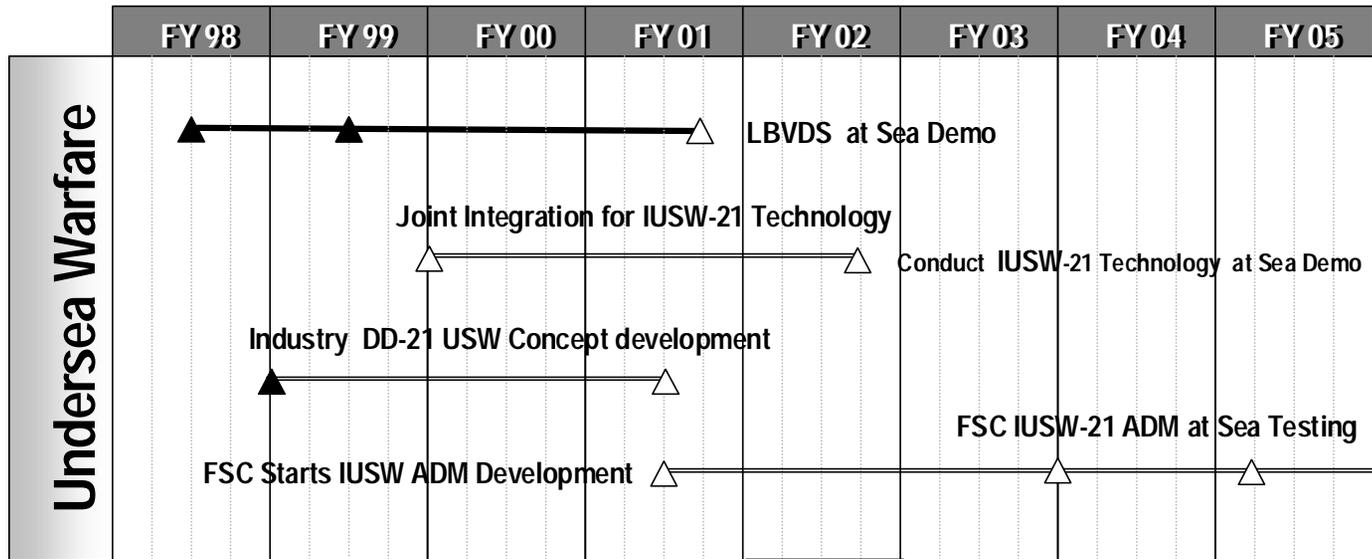
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EXHIBIT R-2a, RDT&E Project Justification		DATE: February 2000
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D. (U) SCHEDULE PROFILE:



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Exhibit R-3 Cost Analysis (page 1)								DATE: February 2000				
APPROPRIATION/BUDGET ACTIVITY			PROGRAM ELEMENT			PROJECT NAME AND NUMBER						
RDT&E, N/BA-4			Shipboard Sys Comp Dev/0603513N			Undersea Warfare (USW)/32468						
Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PY s Cost	FY 99 Cost	FY 99 Award Date	FY 00 Cost	FY 00 Award Date	FY 01 Cost	FY 01 Award Date	Cost to Complete	Total Cost	Target Value of Contract
Primary Hardware Development	Sec845/804	DD 21 Industry Teams	0.000	2.000	11/98	7.244	11/99	15.536	01/01	CONT.	CONT.	
	BAA/CPFF	Competition	0.000	6.944	03/99	5.058	Various	1.531	Various	CONT.	CONT.	
Ancillary Hardware Development											0.000	
Systems Engineering											0.000	
Licenses											0.000	
Tooling											0.000	
GFE											0.000	
Award Fees											0.000	
Subtotal Product Development			0.000	8.944		12.302		17.067		CONT.	CONT.	
Remarks:												
Development Support Equipment											0.000	
Software Development											0.000	
Training Development											0.000	
Integrated Logistics Support											0.000	
Configuration Management											0.000	
Technical Data	WR	NUWC/N Newport, RI	1.000	0.550	12/98	1.318	12/99	1.661	12/00	CONT.	CONT.	
	WR	NSWC DD Dahlgren, VA	0.200	0.075	12/98	0.300	12/99	0.400	12/00	CONT.	CONT.	
	SS/CPFF	APL/JHU Laurel, MD	0.400	0.162	12/98	0.400	12/99	0.500	12/00	CONT.	CONT.	
	SS/CPFF	APL/UW Seattle, WA	0.000	0.150	12/98	0.300	12/99	0.400	12/00	CONT.	CONT.	
	SS/CPFF	ARL/UT Austin., TX	0.000	0.150	12/98	0.300	12/99	0.400	12/00	CONT.	CONT.	
	SS/CPFF	ARL/PSU State Col, PA	0.000	0.150	12/98	0.300	12/99	0.400	12/00	CONT.	CONT.	
	C/CPFF	DSR Arlington, VA	0.000	0.000	N/A	0.134	12/99	0.167	12/00	CONT.	CONT.	
GFE											0.000	
Subtotal Support			1.600	1.237		3.052		3.928		CONT.	CONT.	
Remarks:												

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Exhibit R-3 Cost Analysis (page 2)										DATE: February 2000		
APPROPRIATION/BUDGET ACTIVITY			PROGRAM ELEMENT			PROJECT NAME AND NUMBER						
RDT&E, N/BA-4			Shipboard Sys Comp Dev/0603513N			Undersea Warfare (USW)/32468						
Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PY s Cost	FY 99 Cost	FY 99 Award Date	FY 00 Cost	FY 00 Award Date	FY 01 Cost	FY 01 Award Date	Cost to Complete	Total Cost	Target Value of Contract
Developmental Test & Evaluation											0.000	
Operational Test & Evaluation											0.000	
Tooling											0.000	
GFE											0.000	
Subtotal T&E			0.000	0.000		0.000		0.000		0.000	0.000	
Remarks:												
Contractor Engineering Support											0.000	
Government Engineering Support											0.000	
Program Management Support	GSA	Techmatics Arlington, VA	0.100	0.131	12/98	0.200	12/99	0.200	12/00	CONT.	CONT.	
Miscellaneous	PD/WR	Various	0.000	0.000	Various	0.000	Various	0.040	Various	CONT.	CONT.	
Travel											0.000	
Labor (Research Personnel)											0.000	
Overhead											0.000	
Subtotal Management			0.100	0.131		0.200		0.240		CONT.	CONT.	
Remarks:												
Total Cost			1.700	10.312		15.554		21.235		CONT.	CONT.	
Remarks:												

R-1 SHOPPING LIST - Item No. 39-14 of 39-35

Exhibit R-3, Project Cost Analysis
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EXHIBIT R-2a, RDT&E Project Justification					DATE: February 2000					
APPROPRIATION/BUDGET ACTIVITY		PROGRAM ELEMENT NAME AND NUMBER			PROJECT NAME AND NUMBER					
RDT&E, N/BA-4		Shipboard Sys Component Dev/0603513N			Consolidated Hull, Mechanical & Electrical Improvements (HM&E)/32469					
COST (\$ in Millions)		FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Project Cost		(1) 24.344	24.686	22.109	26.847	26.069	26.444	26.822	CONT.	CONT.
RDT&E Articles Qty		0	0	0	0	0	0	0	CONT.	CONT.
<p>Note (1)) (U) FY 1999 funds were budgeted and executed under PE 0603513N/Project S0382, PE 0603514N/Project S0384, PE 0603514N/Project S1565, and PE 0603563N/Project S2196 (only Affordability Through Commonality) as displayed in the FY99 Presidents Budget exhibits. Funds from PE 0603513N/Project S0382, PE 0603514N/Project S0384, PE 0603514N/Project S1565, and PE 0603563N/Project S2196 (only Affordability Through Commonality) transitioned into PE 0603513N/Project 32469 in FY 2000 and out.</p> <p>A. (U) MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: This project supports the advanced development of DD-21 HM&E ship survivability, auxiliary machinery, and Affordability Through Commonality (ATC) technologies and systems that will enable DD 21 survivability, manning, and life cycle cost goals to be met. The products developed under this project also support the existing fleet and other ship acquisition programs. Note that the efforts under this project were previously supported by four separate projects (See Note 1) and were consolidated to facilitate an integrated system development approach that ensures all design considerations are addressed. The following provides a mission description for each development area (i.e., Survivability, Auxiliary, and Affordability):</p> <p>(U) Survivability: The survivability area supports development of systems and protection concepts that reduce vulnerability to conventional weapons and peacetime accidents and enables, under reduced manning conditions, a rapid recovery of mission capability. Development categories include damage control computer-based systems that provide for rapid systems restoration, fire protection devices that improve probability of survival with a reduced crew ship, and ship protection concepts that reduce magazine and commercial equipment vulnerability.</p> <p>(U) Auxiliary: For existing and future ships, this funding: 1) improves reliability/maintainability of fluid, electrical, and mechanical systems and 2) supports reduced manning through automation of operational, maintenance, and day-to-day functions traditionally performed by the crew, and supports development of auxiliary systems to reduce ship magnetic signature and vulnerability to mines.</p>										

R-1 SHOPPING LIST - Item No. 39-15 of 39-35

Exhibit R-2a, RDT&E Project Justification
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EXHIBIT R-2a, RDT&E Project Justification		DATE: February 2000
APPROPRIATION/BUDGET ACTIVITY RDT&E, N/BA-4	PROGRAM ELEMENT NAME AND NUMBER Shipboard Sys Component Dev/0603513N	PROJECT NAME AND NUMBER Consolidated Hull, Mechanical & Electrical Improvements (HM&E)/32469
<p>(U) Affordability Through Commonality: The Affordability Through Commonality program develops, demonstrates, and validates architectures, technologies, and concepts that reduce total ownership cost of existing and future ships, especially future surface combatants. Focus areas are total ship open system architectures; total ownership cost methods and modeling; use of ownership cost reduction best practices from industry and other services; cost effective equipment selection, maintenance; and logistics support, and innovative, enabling technologies for total ownership cost reduction.</p> <p>1. (U) FY 1999 ACCOMPLISHMENTS:</p> <p>(U) SURVIVABILITY:</p> <ul style="list-style-type: none">- (U) (\$7.407) Conducted full scale underwater explosion shock proof-of-concept demonstration test of Advanced Ship Shock Isolation Systems (ASSIST) machinery mount and raft. Conducted DD 21 ship/ system integration design assessments and finalized machinery mount/ design requirements. Initiated ASSIST planning for DD 21 applicable demonstration employing mount, raft and machinery. Conducted full scale demonstration tests of the effectiveness of anti-fratricide shielding in preventing sympathetic detonation. Conducted DD 21 applicable ship/ launcher magazine protection integration studies. Initiated planning for all-up full scale Integrated Magazine Protection System (IMPS) proof-of-concept demonstration employing multiple missiles, launcher, anti-fratricide shielding and water suppression. Completed Real Time Stability Status (RTSS) Fleet evaluation aboard the USS Rushmore. Completed shipboard demonstration of Damage Control System (DCS) firemain reconfiguration management module. Completed fleet evaluations aboard the ex-USS SHADWELL to demonstrate the effectiveness of alternative reduced manning concepts. Developed preliminary shipboard procedures for firefighting in a chemical, biological, and radiological (CBR) environment. Conducted full scale weapon effects demonstrations of automated fire suppression system. Developed DD 21 automated chilled water system isolation and reconfiguration system options. Continued development of the Advanced Survivability Assessment Program (ASAP) fire and smoke model and initiated development of a crew casualty/damage control model. Initiated development of DD 21 firefighting devices/systems that provide for remote control of a firehose nozzle enabling sustained operations in a reduced manning environment. Conducted survey of commercial robotic firefighting devices, developed operational requirements and initiated prototype system design.		

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EXHIBIT R-2a, RDT&E Project Justification		DATE: February 2000
APPROPRIATION/BUDGET ACTIVITY RDT&E, NBA-4	PROGRAM ELEMENT NAME AND NUMBER Shipboard Sys Component Dev/0603513N	PROJECT NAME AND NUMBER Consolidated Hull, Mechanical & Electrical Improvements (HM&E)/32469
<p>(U) AUXILIARY SYSTEMS:</p> <ul style="list-style-type: none">(U) (\$9.323) Continued development of advanced HM&E machinery and systems architectures to reduce manning and eliminate at-sea maintenance. Initiated low pressure air system full scale demonstration with Component Level Intelligent Distributed Control (CLIDC) system. Initiated laboratory demonstration of automated chilled water and other auxiliary systems with CLIDC systems. Completed evaluation of Polymer Current Limiters (PCL), Ground Fault Limiters (GFL). Continued development of Power Electronic Building Block (PEBB) based Auxiliary Multi-Functional Power Module (AMF PM). Completed GFL algorithm development, SHIPEVAL and implementation. Completed design, fabrication and LABEVAL of 100 ampere, single phase PCL for fuse replacement. Initiated PCL design for 3 phase fuse replacement. Completed concurrent engineering and cost analysis for AMF PM. Initiated development of a magnetic, onboard, self-monitoring, control system (CLDG) for steel hulled surface combatants including onboard sensor suites and control algorithms. Specified and initiated procurement of CLDG components. Completed development of the Underwater Closed Circuit Blasting System. Continued development of the Remotely Operated Vehicle (ROV) Power System. Completed development of the Transient Analysis Model for the Program of Ship Salvage Engineering (POSSE). Continued development of fuel cells for ship service power applications. Continued MCFC 2500 KW conceptual design and trade off analysis. <p>(U) AFFORDABILITY THROUGH COMMONALITY:</p> <ul style="list-style-type: none">(U) (\$7.614) Affordability Through Commonality: Developed, demonstrated, and validated architectures, technologies, and concepts that reduce total ownership costs for the future fleet. Identified areas/methods for common, fleet-wide means to improve life cycle affordability of future naval ships and shipboard systems. Where feasible, backfit to existing ships was pursued. Focus of these efforts was on applications for on-going ship programs (DDG 51, DD21, CVN77, CVN(X)) and other ships in the SCN plan. <p>2. (U) FY 2000 PLAN:</p> <p>(U) SURVIVABILITY/AUXILIARY SYSTEMS</p> <ul style="list-style-type: none">(U) (\$4.280) Complete evaluation/upgrade of AMF PM brassboard and established requirements for prototype. Continue development of IMPS technologies. Complete laboratory demonstration of automated chilled water and other auxiliary systems with component level control; validate design tools. Continue development of the time-dependent, computer-based ASAP for use in evaluating ship designs. Complete development of the ASAP fire and smoke model and continue development of the crew casualty/damage control model. Continue full scale testing aboard the DDG 76 of the advanced closed loop degaussing system. Complete development of the ROV power system. Develop conceptual/preliminary designs of 2.5 megawatt (MW) Ship Service Fuel Cell Power Module and initiate detailed design of 0.5 MW reduced scale demonstrator. Initiate development of the Improved Shaft Coating System. Initiate development of the Smart Tow Monitoring System. Initiate close out of composite pump contract.(U) (\$12.366) Begin initial system design and engineering of DD 21 survivability/auxiliary systems.(U) (\$1.500) Initiate development of composite components and improved ventilation methods/materials that reduce sailor workload.		

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EXHIBIT R-2a, RDT&E Project Justification		DATE:
APPROPRIATION/BUDGET ACTIVITY	PROGRAM ELEMENT NAME AND NUMBER	PROJECT NAME AND NUMBER
RDT&E, N/BA-4	Shipboard Sys Component Dev/0603513N	Consolidated Hull, Mechanical & Electrical Improvements (HM&E)/32469
<p>(U) AFFORDABILITY THROUGH COMMONALITY:</p> <ul style="list-style-type: none">- (U) (\$2.334) Across Program Total Ship Open Systems Architecture: Continue Navy-Industry effort to develop, demonstrate, validate and implement fleet- wide open systems architectures (OSA) and non- proprietary standard interfaces. The OSA will employ commercial processes and commercial off the shelf material and equipment to the greatest extent practicable. Continue to refine the Total Ship Open Systems Architecture Framework, including improved guidance on the architecture definition, definition of standard interfaces, and market surveillance and technology projection processes. Continue to define risk mitigation and demonstration and validation projects for the TOSA concept.- (U) (\$3.706) Continue Total Ship Open System Architecture Demonstration and Validation.- (U) (\$0.500) Initiate development of improved commercial-based distribution systems for reduced sailor workload. <p>3. (U) FY 2001 PLAN</p> <p>(U) SURVIVABILITY/AUXILIARY SYSTEMS</p> <ul style="list-style-type: none">- (U) (\$3.041) Complete development of IMPS technologies. Continue development of the time-dependent, computer-based ASAP for use in evaluating ship designs. Continue development of the ASAP crew casualty/damage control model. Continue full scale testing aboard the DDG 76 of the advanced closed loop degaussing system; update prediction algorithm. Continue development of advanced auxiliary systems, components, and control systems. Complete design of 0.5 MW reduced scale demonstrator and initiate fabrication. Continue development of the Improved Shaft Coating System and the Smart Tow Monitoring System. Initiate planning for a full scale weapons effects demonstration of an automated fire fighting system for bulkhead boundary cooling and compartment sprinkling. Complete close out of composite pump contract.- (U) (\$9.107) Complete initial system design and engineering of DD 21 survivability/auxiliary systems. Begin system/subsystem development of survivability/auxiliary systems.- (U) (\$1.500) Continue development of composite components and improved ventilation methods/materials that reduce sailor workload. <p>(U) AFFORDABILITY THROUGH COMMONALITY:</p> <ul style="list-style-type: none">- (U) (\$2.029) Across Program Total Ship Open Systems Architecture: Continue Navy-Industry effort to develop, demonstrate, validate and implement fleet- wide open systems architectures (OSA) and non- proprietary standard interfaces. The OSA will employ commercial processes and commercial off the shelf material and equipment to the greatest extent practicable. Continue to refine the Total Ship Open Systems Architecture Framework. Investigate alternative total ship architecture concepts reflecting state-of-the-art concepts and practices for commercial industry and other services. Update the TOSA framework and guidance documents to reflect these evolving architectural concepts. Continue to define risk mitigation and demonstration and validation projects for the TOSA concept.- (U) (\$5.932) Total Ship Open System Architecture Demonstration and Validation- (U) (\$0.500) Continue development of improved commercial-based distribution systems for reduced sailor workload.		

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EXHIBIT R-2a, RDT&E Project Justification						DATE: February 2000				
APPROPRIATION/BUDGET ACTIVITY RDT&E, N/BA-4		PROGRAM ELEMENT NAME AND NUMBER Shipboard Sys Component Dev/0603513N			PROJECT NAME AND NUMBER Consolidated Hull, Mechanical & Electrical Improvements (HM&E)/32469					
B. (U) OTHER PROGRAM FUNDING SUMMARY:										
COST (\$ in Millions)		FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	To Complete	Total Cost
SC-21 Total Ship Systems/Engineering/0604300N		120.704	161.118	305.274	303.989	617.796	763.620	857.350	CONT.	CONT.
C. (U) ACQUISITION STRATEGY:										
(U) These development efforts were realigned into this project in an effort to consolidate related DD 21 RDT&E efforts and will be transitioned into the DD 21 acquisition strategy in FY 2000 and out.										

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EXHIBIT R-2a, RDT&E Project Justification		DATE: February 2000	
APPROPRIATION/BUDGET ACTIVITY RDT&E, N/BA-4	PROGRAM ELEMENT NAME AND NUMBER Shipboard Sys Component Dev/0603513N	PROJECT NAME AND NUMBER Consolidated Hull, Mechanical & Electrical Improvements (HM&E)/32469	
D. (U) SCHEDULE PROFILE:			
PROGRAM MILESTONES	FY 1999	FY 2000	FY 2001
Survivability/Auxiliary Systems Deliverables	4Q DD 21 ASSIST Machinery Integration Study 4Q DD 21 IMPS Ship Integration Study 4Q ASSIST UNDEX Machinery Mount Shock Tests 4Q IMPS Demonstration 4Q DCAMS Windows NT Software 4Q DCS Structural Training Software 3Q Remote Control Firefighting Operational Requirements 4Q Reduced Manning Option Evaluations 4Q Firemain Reconfiguration Shipboard Demonstration 4Q Automated Fire Supression Demonstration 3Q Complete GFL SHIPEVAL 4Q GFL Specification 4Q Design/Fabrication 30 PCL 4Q UW Closed Circuit Blast System 4Q Transient Analysis Model 4Q PEM FC Concept Design 4Q MCFC Preliminary Design 1Q Advanced Deg ATD transitions to Surfaces Combatants 4Q CLIDG System for Surface Combatants Defined 2Q Complete LP Air LEBEVAL 4Q Demo Functional Control System Design 4Q Validate Chilled Water Fluid Simulation	1Q Initial System Design 4Q ASAP Fire and Smoke Model 4Q ROV Power System 4Q 2.5 MW Ship Service Fuel Cell Power Module 2Q Initiate Smart Tow Monitoring System 3Q CLDG Ranging of DDG 76 4Q Validate Chilled Water Simulation & Design Tools 2Q Initiate Improved Shaft Coating System 4Q ROV Power System 2Q Prototype AMF PM Fabrication	1Q System/Subsystem Development 4Q ASAP Crew Casualty/DC Model

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Exhibit R-2a, RDT&E Project Justification
(Exhibit R-2a, page 20 of 35)

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EXHIBIT R-2a, RDT&E Project Justification		DATE: February 2000	
APPROPRIATION/BUDGET ACTIVITY RDT&E, N/BA-4	PROGRAM ELEMENT NAME AND NUMBER Shipboard Sys Component Dev/0603513N	PROJECT NAME AND NUMBER Consolidated Hull, Mechanical & Electrical Improvements (HM&E)/32469	
PROGRAM MILESTONES	FY 1999	FY 2000	FY 2001
Affordability Through Commonality (ATC)	4Q PODAC Cost Model Cost Estimating Relationships for Surface Combatants 4Q DD21 Alliance Teams Flexibility, Upgradeability, Supportability, Adapdability Concept Design efforts & technology transfer 4Q Advanced food service Technology demonstration 4Q Advanced pesonnel transfer Architecture implementation 4Q SEALINK/SAVERPRO implementation 4Q Open Systems Architecture interface developmer for open HVAC and open chilled water 4Q Containerized mission element module (CMEMS) concept development 4Q Open Structure Shock & Cost Analysis	4Q Open Systems Architecture Guidance development 4Q SEALINK TRANSITION 4Q DD21 Alliance Teams Flexibility, Upgradeability, Supportability, Adaptability preliminary design efforts & technology transfer 4Q Advanced material handling Architectures 4Q Advanced Accomodation Architectures 4Q Open C4ISR Zone concept development 4Q Open Structure Technology Development 4Q Open distributed data interface development	4Q Open System Architecture interface development for sensor Technologies 4Q DD21 alliance teams technology transfer and Assessments 4Q OSA guidance 4Q OSA business and development 4Q Open C4ISR demonstration 4Q Multi-function transfer system Architecture development 4Q Open distributed data interface implementation

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Exhibit R-3 Cost Analysis (page 1)							DATE: February 2000					
APPROPRIATION/BUDGET ACTIVITY			PROGRAM ELEMENT			PROJECT NAME AND NUMBER						
RDT&E, N/BA-4			Shipboard Sys Comp Dev/0603513N			Consolidated Hull, Mechanical & Electrical Improvement (HM&E)/32469						
Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PY s Cost	FY 99 Cost	FY 99 Award Date	FY 00 Cost	FY 00 Award Date	FY 01 Cost	FY 01 Award Date	Cost to Complete	Total Cost	Target Value of Contract
SURVIVABILITY												
Primary Hardware Development												
Product Development	Sec845/804	DD 21 Industry Teams	0.000	2.020	11/98	12.366	11/99	9.107	10/00	CONT.	CONT.	N/A
	WR	NSWC CD Bethesda, MD	3.332	3.516	Various	2.500	Various	2.500	Various	CONT.	CONT.	
	Various	Other Govt Activities	3.018	1.336	Various	1.463	Various	0.805	Various	CONT.	CONT.	
	Various	Other Contractors	2.100	0.535	Various	1.817	Various	1.236	Various	CONT.	CONT.	
Ancillary Hardware Development											0.000	
Systems Engineering											0.000	
Licenses											0.000	
Tooling											0.000	
GFE											0.000	
Award Fees											0.000	
Subtotal Product Development			8.450	7.407		18.146		13.648		CONT.	CONT.	
Remarks: Auxiliary Systems will be consolidated with Survivability in FY 2000 and out												
AFFORDABILITY THROUGH COMMONALITY												
Engineering Dev, Demo & Eval	Sec845/804	DD-21 Industry Teams	0.000	2.500	11/98	4.611	11/99	5.883	10/00	CONT.	CONT.	
	WR	NSWC CD Bethesda, MD	2.795	2.141	Various	0.739	10/99	1.101	10/00	CONT.	CONT.	
	RC	NSWC CD Bethesda, MD	1.145	0.889	Various	0.000	N/A	0.000	N/A	CONT.	CONT.	
	Various	Other Govt Activities	1.129	0.984	Various	0.200	10/99	0.349	10/00	CONT.	CONT.	
	Various	Other Contractors	1.941	1.100	Various	0.990	Various	1.128	Various	CONT.	CONT.	
Development Support Equipment											0.000	
Software Development											0.000	
Training Development											0.000	
Integrated Logistics Support											0.000	
Configuration Management											0.000	
Technical Data											0.000	
GFE											0.000	
Subtotal Support			7.010	7.614		6.540		8.461		CONT.	CONT.	
Remarks:												

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Exhibit R-3, Project Cost Analysis
(Exhibit R-3, page 22 of 35)

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EXHIBIT R-2a, RDT&E Project Justification						DATE: February 2000				
APPROPRIATION/BUDGET ACTIVITY RDT&E, N/BA-4		PROGRAM ELEMENT NAME AND NUMBER Shipboard Sys Component Dev/0603513N			PROJECT NAME AND NUMBER Integrated Topside Design (ITD)/32470					
COST (\$ in Millions)		FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Project Cost		(1) 13.022	13.756	15.080	18.742	14.760	15.040	15.387	CONT.	CONT.
RDT&E Articles Qty		0	0	0	0	0	0	0	CONT.	CONT.

Note (1) (U) FY 1999 funds were budgeted and executed under PE 0603513N/Project S1712 as displayed in the FY99 President's Budget exhibits. Funds from PE 0603513N/Project S1712 transitioned into PE 0603513N/Project 32470 in FY 2000 and out.

A. (U) MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: This project develops and integrates the necessary technologies to achieve a total integrated topside design focused on DD 21 and future surface combatant ships. Technology areas including topside signature control, sensor and antenna integration, weapon system integration, HM&E integration, related decision-making tools, and composite materials will be addressed. Other stand alone technology programs will be synergistically integrated with this topside design integration effort to assure total ship systems integration for future ship design efforts. Surface combatants will need an added (stealth) layer of defense to support hardkill and softkill systems in defeating future threats. Composite materials will also be considered for their corrosion control, reduced maintenance, and reduced manning attributes. This project also develops improved equipments that are small but critical components of non-propulsion HM&E systems. This program is directed toward improved affordability, performance, reduced life cycle cost, reliability and maintainability, signature reduction, standardization, and weight and manning reductions for the existing and future fleet.

1. (U) FY 1999 ACCOMPLISHMENTS:

- (U) (\$8.507) Continued development and validation of composite material design procedures and revision of the PC-based composite materials database. Evaluated composite materials for their corrosion control and reduced maintenance attributes. Continued scale modeling signature assessments. Continued development of Radar Cross Section (RCS), Infrared (IR), and Electronic Warfare (EW) prediction codes. Began development of improved baseline EM ENGINEERING toolset. Supported transition of AEM/S system to LPD-17 topside. Continued development of composite value family and advanced gas turbine genset feasibility study. Initiated development of heatpipe based bleed air heat exchanger.

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EXHIBIT R-2a, RDT&E Project Justification						DATE: February 2000				
APPROPRIATION/BUDGET ACTIVITY RDT&E, N/BA-4		PROGRAM ELEMENT NAME AND NUMBER Shipboard Sys Component Dev/0603513N			PROJECT NAME AND NUMBER Integrated Topside Design (ITD)/32470					
<p>- (U) (\$4.515) Developed a modeling and simulation plan and a risk reduction plan for integrated topside design (ITD) activities. Initiated risk reduction test in support of DD 21 Industry Team ITD risk reduction plan.</p> <p>2. (U) FY 2000 PLAN:</p> <ul style="list-style-type: none"> - (U) (\$2.953) Continue validation of composite material design procedures and revision of the PC-based composite materials database. Continue evaluation of composite materials for their corrosion control and reduced maintenance attributes. Continue development of RCS, IR, and EW prediction codes. Validate and improve EM Engineering Tools. Develop Infrared Signature Database Update. Validate and publish Low Observable (LO) Model scaling techniques. - (U) (\$9.803) Initiate engineering efforts required to begin initial system design of an Integrated Topside Design for DD 21. - (U) (\$1.000) Continue development of heat pipe based bleed air heat exchanger and affordable HM&E machinery and architectures for existing and future fleet. Complete advance gas turbine genset feasibility design study. <p>3. (U) FY 2001 PLAN:</p> <ul style="list-style-type: none"> - (U) (\$3.693) Continue validation of composite material design procedures and revision of the PC-based composite materials database. Evaluate composite materials for their corrosion control and reduced maintenance attributes. Continue development of RCS, IR, and EW prediction codes. Continue to validate and improve EM Engineering Tools. - (U) (\$10.387) Complete engineering efforts required for initial system design of DD21 ITD. Begin ITD system/subsystem design for DD 21. - (U) (\$1.000) Complete heat pipe based bleed air heat exchanger. Continue development of affordable HM&E machinery and architectures for existing and future fleet. <p>B. (U) OTHER PROGRAM FUNDING SUMMARY:</p>										
COST (\$ in Millions)		FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	To Complete	Total Cost
SC-21 Total Ship Systems/Engineering/0604300N		120.704	161.118	305.274	303.989	617.796	763.620	857.350	CONT.	CONT.

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EXHIBIT R-2a, RDT&E Project Justification		DATE: February 2000																																				
APPROPRIATION/BUDGET ACTIVITY RDT&E, N/BA-4	PROGRAM ELEMENT NAME AND NUMBER Shipboard Sys Component Dev/0603513N	PROJECT NAME AND NUMBER Integrated Topside Design (ITD)/32470																																				
<p>C. (U) ACQUISITION STRATEGY:</p> <p>(U) These development efforts were realigned into this project in an effort to consolidate related DD 21 RDT&E efforts and will be transitioned into the DD 21 acquisition strategy in FY 2000 and out.</p> <p>D. (U) SCHEDULE PROFILE:</p> <table border="0" style="width: 100%; text-align: center;"> <thead> <tr> <th colspan="3"><u>PROGRAM MILESTONES</u></th> </tr> <tr> <th><u>FY1999</u></th> <th><u>FY 2000</u></th> <th><u>FY 2001</u></th> </tr> </thead> <tbody> <tr> <td>2Q C_Missile Update</td> <td>4Q EM Engineering Tool Validation & Upgrade</td> <td>4Q RCS/IR/EW Code Updates</td> </tr> <tr> <td>4Q RCS Medium Scale Model Test Results</td> <td>4Q RCS, IR, EW Code Updates</td> <td>4Q EM Engineering Tool Validation & Improvement</td> </tr> <tr> <td>4Q Final LPD Mast EM/Signature/Structural Design</td> <td>4Q Composite Design Guide Updates</td> <td>4Q Composite Design Guide Updates</td> </tr> <tr> <td>4Q EM Engineering Baseline Upgrade</td> <td>2Q G.T. Genset Assessment Report</td> <td></td> </tr> <tr> <td>4Q Complete Structural Design Guide</td> <td>4Q 2 Way ball valve ILS package</td> <td></td> </tr> <tr> <td>4Q ITD M&S and Risk Reduction Plans</td> <td></td> <td></td> </tr> <tr> <td>2Q Solar Conceptual Design Data</td> <td></td> <td></td> </tr> <tr> <td>4Q Gen Set Studies Complete</td> <td></td> <td></td> </tr> <tr> <td>4Q 3 Way Ball Valve Drawing and ILS Package</td> <td></td> <td></td> </tr> <tr> <td>4Q Allison Conceptual Design Data</td> <td></td> <td></td> </tr> </tbody> </table>			<u>PROGRAM MILESTONES</u>			<u>FY1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	2Q C_Missile Update	4Q EM Engineering Tool Validation & Upgrade	4Q RCS/IR/EW Code Updates	4Q RCS Medium Scale Model Test Results	4Q RCS, IR, EW Code Updates	4Q EM Engineering Tool Validation & Improvement	4Q Final LPD Mast EM/Signature/Structural Design	4Q Composite Design Guide Updates	4Q Composite Design Guide Updates	4Q EM Engineering Baseline Upgrade	2Q G.T. Genset Assessment Report		4Q Complete Structural Design Guide	4Q 2 Way ball valve ILS package		4Q ITD M&S and Risk Reduction Plans			2Q Solar Conceptual Design Data			4Q Gen Set Studies Complete			4Q 3 Way Ball Valve Drawing and ILS Package			4Q Allison Conceptual Design Data		
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APPROPRIATION/BUDGET ACTIVITY			PROGRAM ELEMENT			PROJECT NAME AND NUMBER						
RDT&E, N/BA-4			Shipboard Sys Comp Dev/0603513N			Integrated Topside Design/32470						
Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PY s Cost	FY 99 Cost	FY 99 Award Date	FY 00 Cost	FY 00 Award Date	FY 01 Cost	FY 01 Award Date	Cost to Complete	Total Cost	Target Value of Contract
Primary Hardware Development	Sec845/804	DD 21 Industry Teams	0.000	4.515	11/98	9.803	11/99	10.387	11/00	CONT.	CONT.	
Ancillary Hardware Development											0.000	
Systems Engineering											0.000	
Licenses											0.000	
Tooling											0.000	
GFE											0.000	
Award Fees											0.000	
Subtotal Product Development			0.000	4.515		9.803		10.387		CONT.	CONT.	
Remarks:												
Engineering Support	WR	NSWC CD Bethesda, MD	5.532	4.210	12/98	2.282	12/99	2.933	12/00	CONT.	CONT.	
	WR	NRL Suitland, MD	1.005	1.280	12/98	0.622	12/99	0.747	12/00	CONT.	CONT.	
	Various	Other Gov't Activities	0.120	0.875	12/98	0.225	12/99	0.225	12/00	CONT.	CONT.	
	RC	NAVLOGCTR, PA	0.000	0.983	12/98	0.450	12/99	0.500	12/00	CONT.	CONT.	
	Various	Other Contractors	2.054	0.376	12/98	0.199	12/99	0.033	12/00	CONT.	CONT.	
Software Development	C/CPFF	TBD	1.508	0.638	03/99	0.175	12/99	0.255	12/00	CONT.	CONT.	
	MP	JSC Annapolis, MD	0.210	0.145	12/98	0.000	N/A	0.000	N/A	CONT.	CONT.	
Development Support Equipment											0.000	
Software Development											0.000	
Training Development											0.000	
Integrated Logistics Support											0.000	
Configuration Management											0.000	
Technical Data											0.000	
GFE											0.000	
Subtotal Support			10.429	8.507		3.953		4.693		CONT.	CONT.	
Remarks:												

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Exhibit R-3, Project Cost Analysis
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APPROPRIATION/BUDGET ACTIVITY			PROGRAM ELEMENT			PROJECT NAME AND NUMBER						
RDT&E, N/BA-4			Shipboard Sys Comp Dev/0603513N			Integrated Topside Design/32470						
Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PY s Cost	FY 99 Cost	FY 99 Award Date	FY 00 Cost	FY 00 Award Date	FY 01 Cost	FY 01 Award Date	Cost to Complete	Total Cost	Target Value of Contract
Developmental Test & Evaluation											0.000	
Operational Test & Evaluation											0.000	
Tooling											0.000	
GFE											0.000	
Subtotal T&E			0.000	0.000		0.000		0.000		0.000	0.000	
Remarks:												
Contractor Engineering Support											0.000	
Program Management Support											0.000	
Miscellaneous											0.000	
Travel											0.000	
Labor (Research Personnel)											0.000	
Overhead											0.000	
Subtotal Management			0.000	0.000		0.000		0.000		CONT.	CONT.	
Remarks:												
Total Cost			10.429	13.022		13.756		15.080		CONT.	CONT.	
Remarks:												

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EXHIBIT R-2a, RDT&E Project Justification							DATE: February 2000			
APPROPRIATION/BUDGET ACTIVITY		PROGRAM ELEMENT NAME AND NUMBER			PROJECT NAME AND NUMBER					
RDT&E, N/BA-4		Shipboard Sys Component Dev/0603513N			Integrated Power Systems (IPS)/32471					
COST (\$ in Millions)		FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Project Cost		(1) 31.840	25.723	84.057	106.277	69.342	26.860	9.957	CONT.	CONT.
RDT&E Articles Qty		0	0	0	0	0	0	0	CONT.	CONT.
<p>Note (1) (U) FY 1999 funds were budgeted and executed under PE 0603573N/Project S1314 as displayed in the FY99 President's Budget exhibits. Funds from PE 0603573N/Project S1314 (only Integrated Power Systems) transitioned into PE 0603513N/Project 32471 in FY 2000 and out.</p> <p>A. (U) MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: This project supports the Integrated Power Systems (IPS) program. IPS provides total ship electric power, including electric propulsion, power conversion and distribution, and mission load interfaces to the electric power system. IPS supports multiple ship class applications for future surface ships, with DD21 being the primary ship application target. On 6 January 2000, SECNAV announced Navy intent that DD21 be an electric drive ship with integrated power architecture. The goals of the IPS are to reduce acquisition and operating costs of naval ships and increase military effectiveness. These goals are to be accomplished by leveraging investments in technologies that will be usable by both military and commercial sectors.</p> <ul style="list-style-type: none"> - (U) IPS has the potential to revolutionize the design, construction and operation of U.S. naval ships by using electricity as the primary energy transfer medium aboard ship. The flexibility of electric power transmission allows power generating modules with various power ratings to be connected to propulsion loads and ship service in any arrangement that supports the ship's mission at lowest overall cost. Systems engineering in IPS is focused on increasing the commonality of components used across ship types and in developing modules which will be integral with standardization, zonal system architectures, and generic shipbuilding strategies. The purpose of increased commonality is to reduce the total cost of ship ownership by using common modules composed of standard components and/or standard interfaces. - (U) IPS addresses ship platform program goals through: reduced ship acquisition cost through integration of propulsion and ship's service prime movers; lower ship operational costs resulting from more flexible operating characteristics and more efficient components; reduced ship construction costs by allowing more extensive modular construction of power generation, distribution, and loads if desired; improved ship survivability and reduced vulnerability through increased arrangement flexibility and improved electrical system survivability; reduced manning through improved power management systems and reduced on-board maintenance requirements; improved ship signature characteristics, if required; improved design adaptability to meet future requirements of multiple ship types or missions; integrating power management and protection by fully utilizing the power electronics in the system to perform fault protection as well as power conversion and load management functions; simplified technology insertion which allows new technologies to be installed within IPS much more inexpensively than presently possible; and, reduced machinery system acquisition costs through utilization of commercially shared technologies and components. The efforts in this project are divided into three major areas as follows: 										

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<p>- (U) System development: IPS development consists of the efforts necessary to develop and demonstrate warfighting and cost reduction requirements, as well as related risk reduction for ship platform applications. System development also includes all efforts to qualify and test integrated power system equipment for DD21.</p> <p>- (U) At Sea Testing: At Sea Testing of IPS subsystems and components will be conducted on the Trimaran Demonstrator developed and built under a US/UK cooperative Memorandum of Understanding (MOU) signed 3 September 1997. Initial testing on the Trimaran will focus on Naval Architectural and sea-keeping aspects of the Trimaran hull form. The Trimaran is being constructed initially with a commercial electric drive system as well as provisions for fitting IPS components. An opportunity for the US to backfit IPS components and conduct at sea testing is built into the MOU. The US financial contribution to the MOU is also funded from this project. A contract for construction of the demonstrator was awarded in July, 1998. The efforts in this project support the at sea testing on the Trimaran Demonstrator.</p> <p>- (U) Mission Load Interfaces: Studies have shown that significant opportunities exist to reduce the cost and improve the performance of combat and auxiliary systems by providing the type and quantity of power required directly to the user system. Traditional methods provide standard power and require individual users to perform multiple conversions and conditioning steps prior to use. The efforts in this project provide for initial studies, development, and testing.</p> <p>1. (U) FY 1999 ACCOMPLISHMENTS:</p> <p>- (U) (\$30.195) Systems Development: Continued development of IPS. Completed factory acceptance testing (FAT) of the FSAD propulsion motor/converter. Took delivery of Ship Service Distribution System (SSDS) equipment and propulsion motor/converter. Completed Installation and Checkout (INCO) of propulsion motor/converter. Completed integration of all advanced development equipment. Conducted advanced development testing at the Land Based Engineering Site (LBES) at NSWCCD Philadelphia PA to: verify and characterize individual component performance; verify that system design requirements are met and validate design tools; verify that requirements for power quality are met throughout the advanced development system; characterize system interfaces for use in future performance/interface specifications; and validate the distributed control system architecture, system design, and performance. Provided testing feedback to DD 21 design teams. In conjunction with DD21 industry teams: evaluated the differences between conventional mechanical drive systems and other advanced technologies, including permanent magnet motors for the integrated power system architecture concept options based on industry specific approaches to DD21 design. Began combat systems interface studies to determine areas where combat system performance can be improved or where cost can be reduced. Commenced a DT Assist by COMPTEVFOR. Developed system description and concept of operations for modular survivable distribution architecture to be demonstrated at LBES. Supported the OSD business case study of Integrated Power systems, Common Electric Drive technologies, and further warfighting benefits of Integrated Power Systems.</p>		

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APPROPRIATION/BUDGET ACTIVITY RDT&E, N/BA-4	PROGRAM ELEMENT NAME AND NUMBER Shipboard Sys Component Dev/0603513N	PROJECT NAME AND NUMBER Integrated Power Systems (IPS)/32471
<p>- (U) (\$0.600) At Sea Testing: Note: At sea testing of IPS subsystems and components will be conducted on the Trimaran Demonstrator developed and built under a US/UK cooperative MOU. Began system analysis and design.</p> <p>- (U) (\$1.045) Mission Load Interfaces: Commence assessment of C4I electronic load interfaces. Commence development of Variable Speed Drive (VSD) motor controller for auxiliary applications.</p> <p>2. (U) FY 2000 PLAN:</p> <p>- (U) (\$23.823) Systems Development: Continue IPS design, development, and integration including performance analysis and testing, modeling and simulation, life cycle cost analysis, producibility studies, manning studies, module development, ship integration, architecture design and related efforts. Continue support for DD 21 development and design efforts as well as support for other ship platforms. Continue advanced development testing at NSWCCD, Philadelphia PA, including controls and power management upgrades, demonstrating various operational modes, and incorporating multi workstation control and automated reconfiguration. Award 804/845 Agreements in December 1999 for Integrated Fight Through Power (IFTP) to Silicon Power Corporation, Exton, PA., Eaton Corporation - Navy Controls Division, Milwaukee, WI., General Atomics, San Diego, CA., Alstom Drives and Controls, Rugby, United Kingdom, L3 Communications SPD Technologies, Inc. Power Systems Group Anaheim, CA., Northrop Grummon Marine Systems, Sykesville, MD. IFTP Agreements will be awarded to mitigate potential risks associated with a fielded IPS system. Efforts include completing preliminary design and beginning detailed design of hardware required to replace Functional Equivalent Modules (FEMs) and populate IPS baseline configuration for survivability testing. Continue propulsion motor analysis using the reduced scale Laboratory Drive Motor. Commence preparations for qualification and test of DD21 integrated power system components via DD21 Industry Teams. Commence advanced development design of permanent magnet motors.</p> <p>- (U) (\$0.800) At Sea Testing: Note: AT sea testing of IPS subsystems and components will be conducted on the Trimaran Demonstrator developed and built under a US/UK cooperative MOU. Continued design of the Trimaran IPS configuration for at-sea testing. Begin development of IPS control system modifications for use during at-sea testing.</p> <p>- (U) (\$1.100) Mission Load Interfaces: Conduct initial combat systems/survivability demonstration to show improved performance and potential to reduce combat system costs. Continue development of VSD motor controller for auxiliary applications. Continue assessment of C4I electronic load interfaces.</p> <p>(U) FY 2001 PLAN</p> <p>- (U) (\$75.438) Systems Development: Continue IPS design, development, and integration including performance analysis and testing, modeling and simulation, life cycle cost analysis, producibility studies, manning studies, module development, ship integration, architecture design and related efforts. Continue upgrading IPS simulation/stimulation capability for total system risk reduction. Continue support for DD21 design efforts and planned down-select to a single ship concept as well as support for other ship platforms. Complete acoustics testing of the IPS FSAD motor. Continue advanced development testing at NSWC CD, Philadelphia PA. Continue IFTP efforts to mitigate potential risks associated with a fielded IPS system. Efforts include completing detailed design and begin fabrication of hardware required to populate IPS baseline configuration for survivability testing. Demonstrate the survivability and zonal isolation/fight through features of the advanced development system. Demonstrate automated system reconfiguration and start up.</p>		

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EXHIBIT R-2a, RDT&E Project Justification						DATE: February 2000				
APPROPRIATION/BUDGET ACTIVITY RDT&E, N/BA-4	PROGRAM ELEMENT NAME AND NUMBER Shipboard Sys Component Dev/0603513N	PROJECT NAME AND NUMBER Integrated Power Systems (IPS)/32471								
<p>Continue qualification and test of DD21 integrated power system components via DD21 Industry Teams. Commence Long Lead Material (LLM) procurement of DD21integrated power system components for system testing. Continue advanced development of permanent magnet motors and other advanced power system technologies.</p> <p>- (U) (\$8.619) At Sea Testing: Note: At sea testing of IPS subsystems and components will be conducted on the Trimaran Demonstrator developed and built under a US/UK cooperative MOU. Provide funding for the Trimaran under the terms of the US/UK MOU. Complete detailed design and begin procurement of hardware required for at sea testing. Continue detailed development and design of the Trimaran IPS configuration for at sea testing. Continue development of IPS control system modifications for use during at-sea testing.</p>										
B. (U) OTHER PROGRAM FUNDING SUMMARY:										
COST (\$ in Millions)		FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	To Complete	Total Cost
SC-21 Total Ship Systems/Engineering/0604300N		120.704	161.118	305.274	303.989	617.796	763.620	857.350	CONT.	CONT.
<p>C. (U) ACQUISITION STRATEGY: (U) IPS is a candidate system for DD-21 and all other future surface ships.</p>										

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RDT&E, N/BA-4			Shipboard Sys Comp Dev/0603513N			Integrated Power System/32471						
Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PY s Cost	FY 99 Cost	FY 99 Award Date	FY 00 Cost	FY 00 Award Date	FY 01 Cost	FY 01 Award Date	Cost to Complete	Total Cost	Target Value of Contract
Primary Hardware Development	C/CPAF	Lockhead M Syracuse, NY	9.417	12.655	12/98				12/00	CONT.	CONT.	
	Sec845/804	DD 21 Industry Teams	0.000	4.000	06/99	15.770	11/99	48.645	12/00	CONT.	CONT.	
	Sec845/804	IFTP Teams	0.000	1.200	07/99	3.248	12/99	20.543	12/00	CONT.	CONT.	
	US/UK MOU	DERA, UK	0.000	0.000	N/A	0.000	N/A	1.630	12/00	CONT.	CONT.	
	WR	NSWCCD Annapolis, MD	3.030	4.845	12/98	2.100	12/99	6.657	12/00	CONT.	CONT.	
	MISC	Other Contractors	1.160	1.525	12/98	1.100	12/99	2.500	12/00	CONT.	CONT.	
	MISC	Other Govt Activities	0.002	0.856	12/98	0.100	12/99	0.482	12/00	CONT.	CONT.	
Ancillary Hardware Development											0.000	
Systems Engineering											0.000	
Licenses											0.000	
Tooling											0.000	
GFE											0.000	
Award Fees	C/CPAF	Lockhead M Syracuse, NY	0.801	0.670	12/99	0.272	08/00	TBD				
Subtotal Product Development			14.410	25.751		22.590		80.457		CONT.	CONT.	
Remarks:												
Development Support Equipment											0.000	
Software Development											0.000	
Training Development											0.000	
Integrated Logistics Support											0.000	
Configuration Management											0.000	
Technical Data											0.000	
GFE											0.000	
Subtotal Support			0.000	0.000		0.000		0.000		0.000	0.000	
Remarks:												

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APPROPRIATION/BUDGET ACTIVITY			PROGRAM ELEMENT			PROJECT NAME AND NUMBER						
RDT&E, N/BA-4			Shipboard Sys Comp Dev/0603513N			Integrated Power System/32471						
Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PY s Cost	FY 99 Cost	FY 99 Award Date	FY 00 Cost	FY 00 Award Date	FY 01 Cost	FY 01 Award Date	Cost to Complete	Total Cost	Target Value of Contract
Developmental Test & Evaluation	WR	NSWC CD Philadelphia, PA	3.050	5.988	12/98	3.033	12/99	3.500	12/00	CONT.	CONT.	
Operational Test & Evaluation											0.000	
Tooling											0.000	
GFE											0.000	
Subtotal T&E			3.050	5.988		3.033		3.500		0.000	CONT.	
Remarks:												
Contractor Engineering Support											0.000	
Program Management Support											0.000	
Miscellaneous	Various	Various	0.100	0.101	12/98	0.100	12/99	0.100	N/A	CONT.	CONT.	
Travel											0.000	
Labor (Research Personnel)											0.000	
Overhead											0.000	
Subtotal Management			0.100	0.101		0.100		0.100		CONT.	CONT.	
Remarks:												
Total Cost			17.560	31.840		25.723		84.057		CONT.	CONT.	
Remarks:												

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